Interactive Web Programming

1st semester of 2021

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Heavily based on **Victoria Kirst** slides

Today's schedule

- Syllabus
- Course Info
- Browsers
- A little bit about **HTML** and **CSS**

- Homework 0 assigned and due **this Tuesday 09/03**

Check out the course website for all this and more:

https://murilocamargos.github.io/iwp/

Syllabus

Course Goals

If you never take another web programming class again, you will leave this course with the following skills:

- Create **attractive, small scale web sites or apps** that at least mostly work on phones
- Have the **vocabulary and background knowledge** to understand technical writing/discussions about the web (e.g. web API documentation; random blog posts)
- Have the **foundation** to pursue the areas of web programming that you're interested in (if you choose)

(Course Non-goals)

It is **not** a class to take to learn how to code.

- Programming Languages is a prereq. It should be sufficient.

It is **not** a class that will turn you into a senior frontend/backend developer.

- Nor is any class; software takes years of experience to develop expertise.

It is **not** a class that will teach you all there is to know about web programming.

- For example, we will **not** teach how to support old browsers, legacy devices, etc.

The course, in detail

- **Frontend fundamentals (Client)**:
  - HTML
  - CSS
  - JavaScript
  - D3

- **Backend fundamentals (Server):**
  - Server on NodeJS + Express
  - Database via MongoDb and Mongoose

CSS

HTML (~1 day)

- Key concepts: inline, block, inline-block

CSS (~1.5 weeks)

- Multiple rendering styles: natural, flex, positioned, float
- Mobile layouts
- Transforms and animations (maybe)
- **FYI: No libraries or compiled CSS**

Modern JS / ES6+

Later in the quarter, we will read and write JavaScript that looks sort of like this:

```
(async () => {
  let choice = 'e';
  do {
    choice = await askQuestion('Enter choice');
    await processChoice(choice);
  } while (choice != 'e');
})();
```

Modern JS / ES6+

JavaScript (~5 weeks)

- JavaScript classes
- Relevant functional programming
  - Lambdas
  - Generator functions and async/await
  - "Fat arrow" vs function
  - Closures
- Creating and using Promises
- Understanding the Event Loop
- Modules and encapsulation

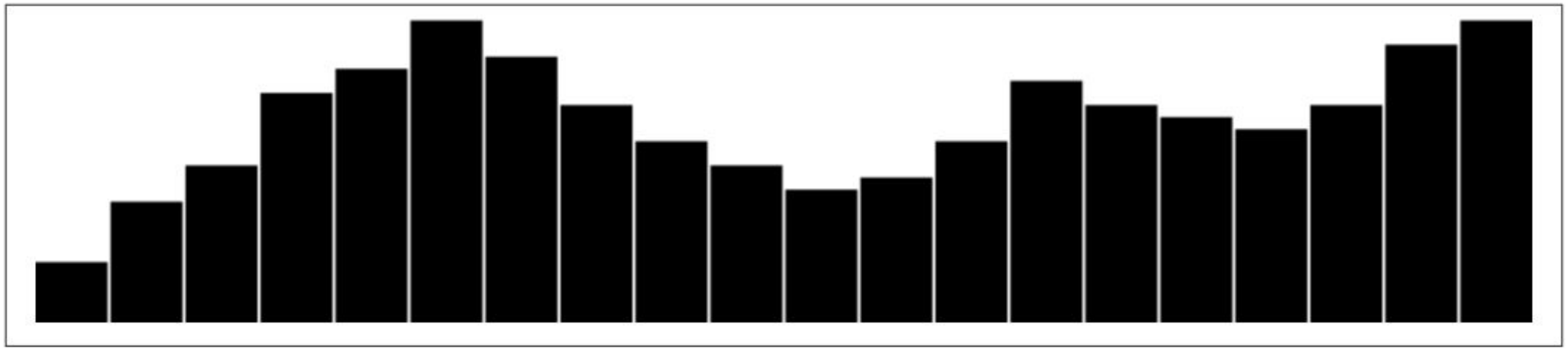
NO frontend framework; minimal libraries

<u>No</u> Angular/React/JQuery/etc

D3

D3 (~2 weeks)

- Fundamentals and Scalable Vector Graphics (SVG)
- Drawing with data
- Scales and Axes
- Updates, Transitions and Motion



Backend

The coverage of server-side programming will be light.

Backend stack:

NodeJS + Express + MongoDB via Mongoose (~4 weeks)

- What is a server
- What is npm
- How to serve static web pages
- How to server JSON via REST APIs
- Writing to and loading from a database
- Authentication via OAuth2 (i.e. login via Gmail account)

Course info

Disclaimer

This is the first ever offering of this course, meaning:

- **Everything is subject to change.** Including everything I've just told you and everything I'm about to tell you.

- **There will be all the mistakes of a new course!**
  - Bugs in homework
  - Awkward lectures
  - Things that are too hard / too easy

Please be patient with us! We are also soliciting your constructive feedback.

Course Structure

"Homework 0" + ~6 homeworks

- We’ll create a web app throughout the course
- Each homework will increment this web app
- Each homework with have a multiple choice "mini-homework" attached to it
- **Individual** assignments; no pairs or groups

0 exams

- No final, no midterm, no exams

Lateness policy

- Every homework may be submitted up to 48 hours after the deadline, without penalty.

- Homework submitted on time will receive a small bonus to their homework score.

- Submissions are **not accepted** beyond the 48-hour grace period. The grace period is strictly enforced.

Browser and Text editor/IDE

- **Text editor:** You can use whatever you want. We recommend VSCode.

- **Browser:** Your code must work on Chrome, as that is what I'll use when grading your homework. It will not be tested in any other browser.

- **Homework turn-in:** We are using GitHub Classroom for assignment turnin.

Complete **Homework 0** to get all set up with your homework workflow in this course!

Lectures

Tue-Thu, 14h00-15h40 (Zoom)

- Lectures will be recorded
- Nothing will be graded in lecture
- But please come!
    - If you attend and do not feel the lectures are helpful, please send us a feedback!

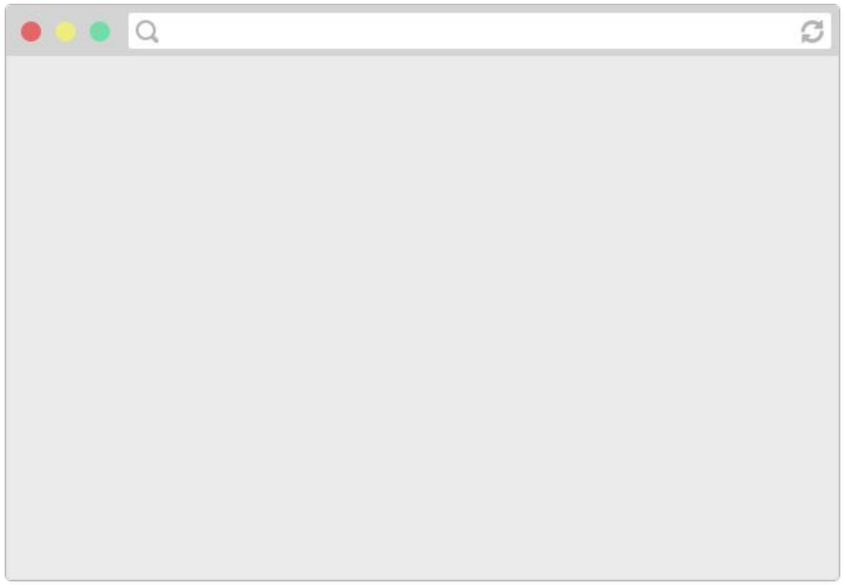
Questions?

Today's schedule

- ~~Syllabus~~
- ~~Course Info~~
- Browsers
- A little bit about **HTML** and **CSS**

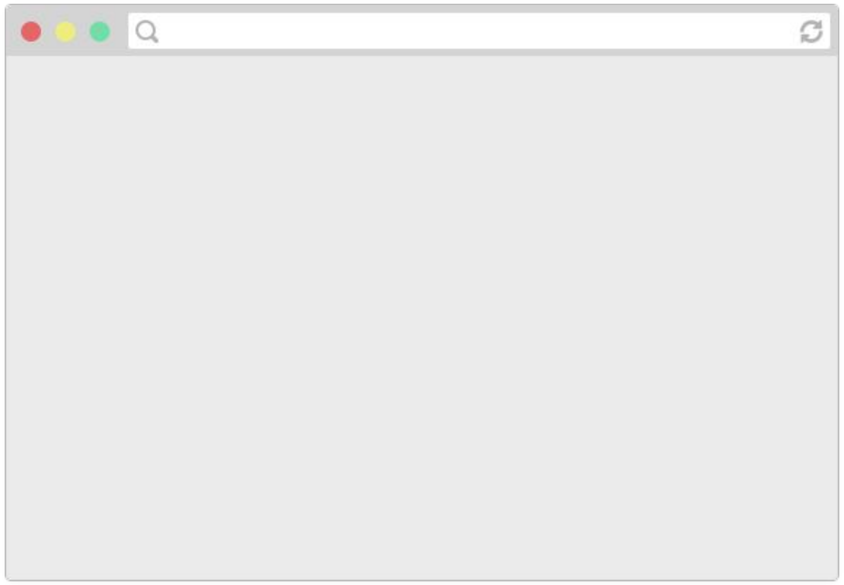
Browsers

How do web pages work?



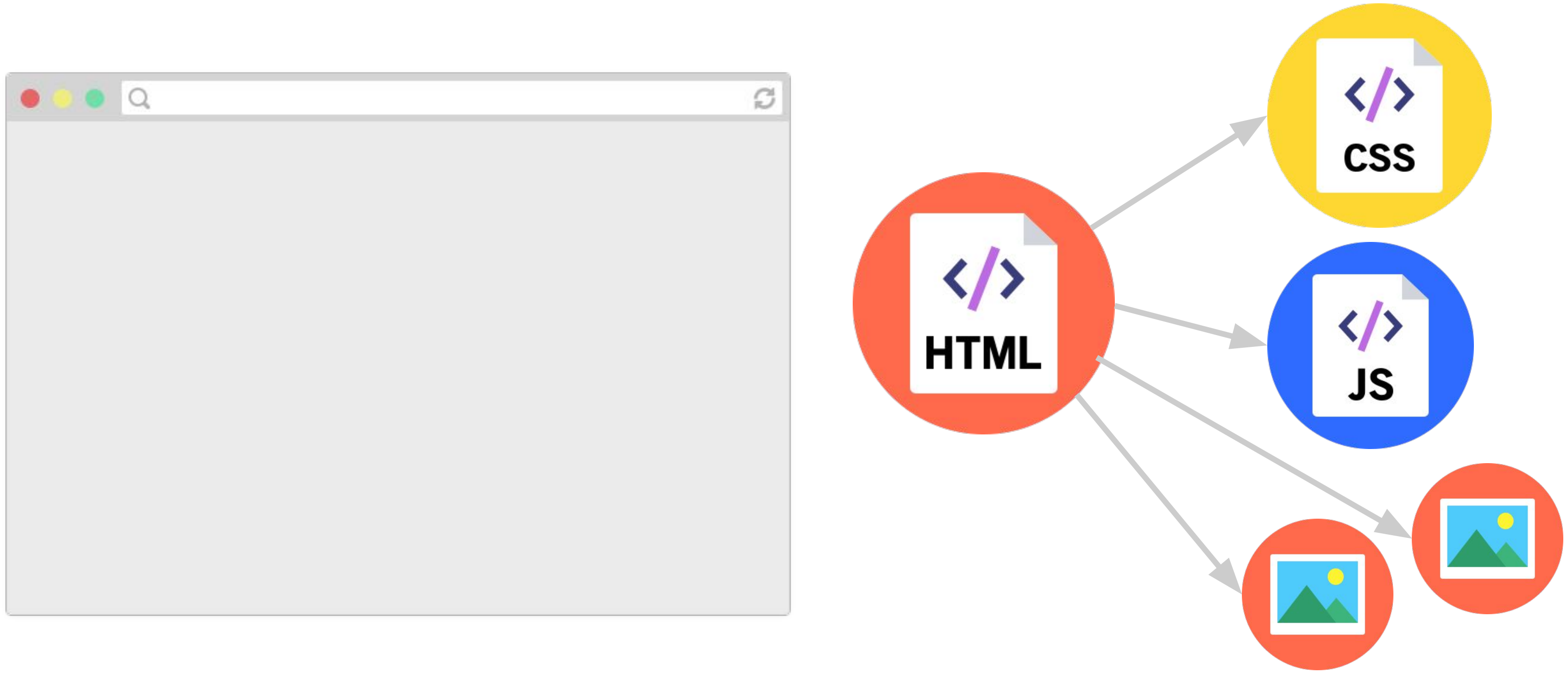
Browsers are applications that can display web pages.
E.g. Chrome, Firefox, Safari, Internet Explorer, Edge, etc.

How do web pages work?



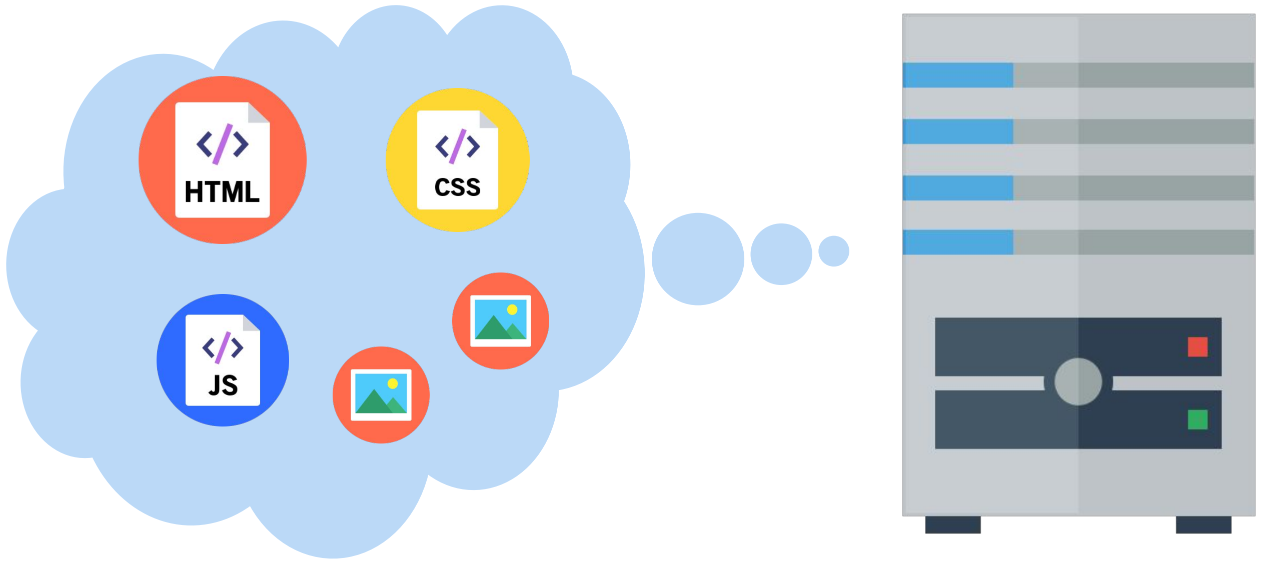
Web pages are written in a markup language called **HTML**, so browsers display a web page by reading and interpreting its HTML.

How do web pages work?



The HTML file might link to other resources, like images, videos, as well as **JavaScript** and **CSS** (stylesheet) files, which the browser then also loads.

How do web pages work?

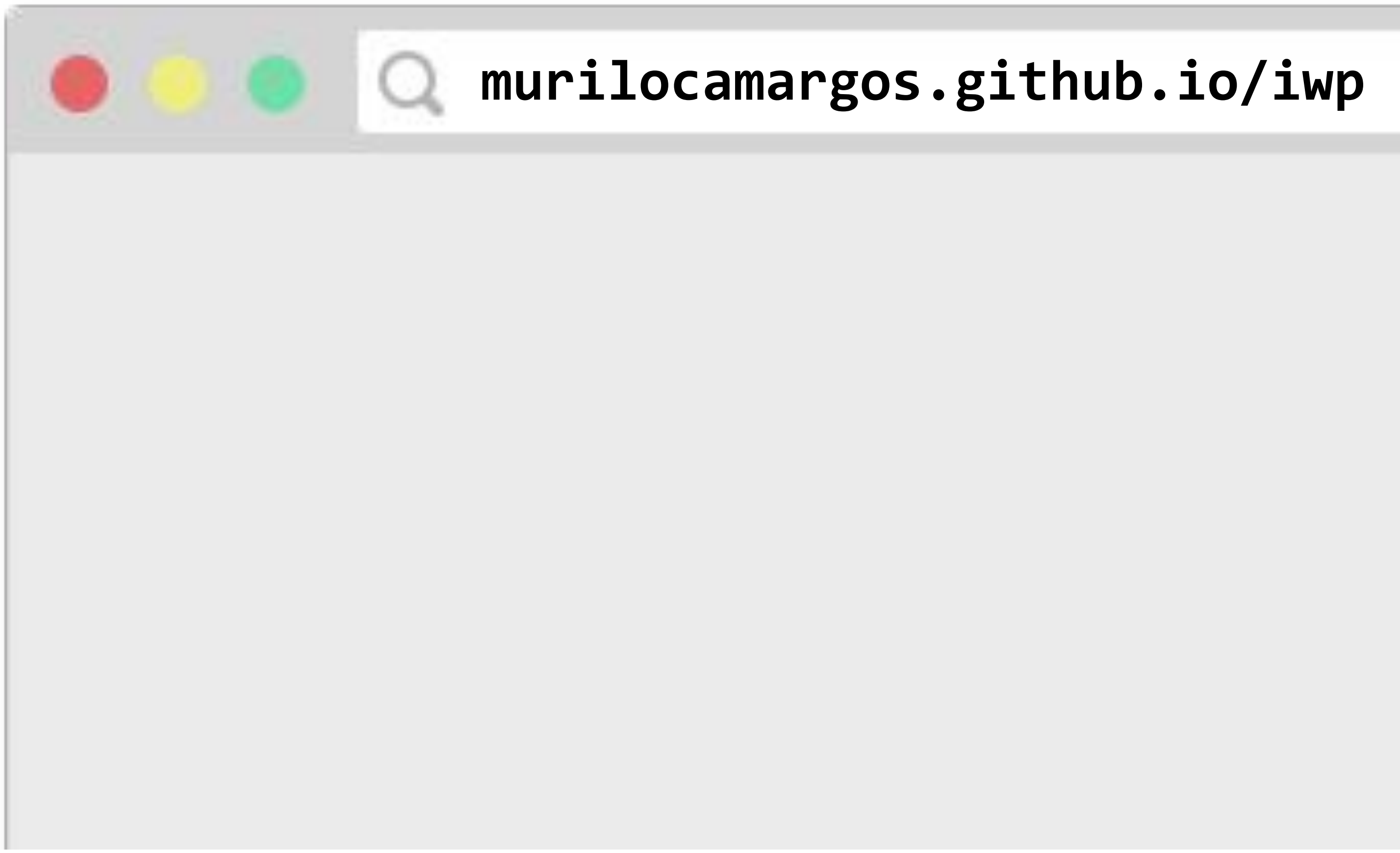


A **web server** is a program running on a computer that delivers web pages in response to requests.

It either stores or generates the web page returned.

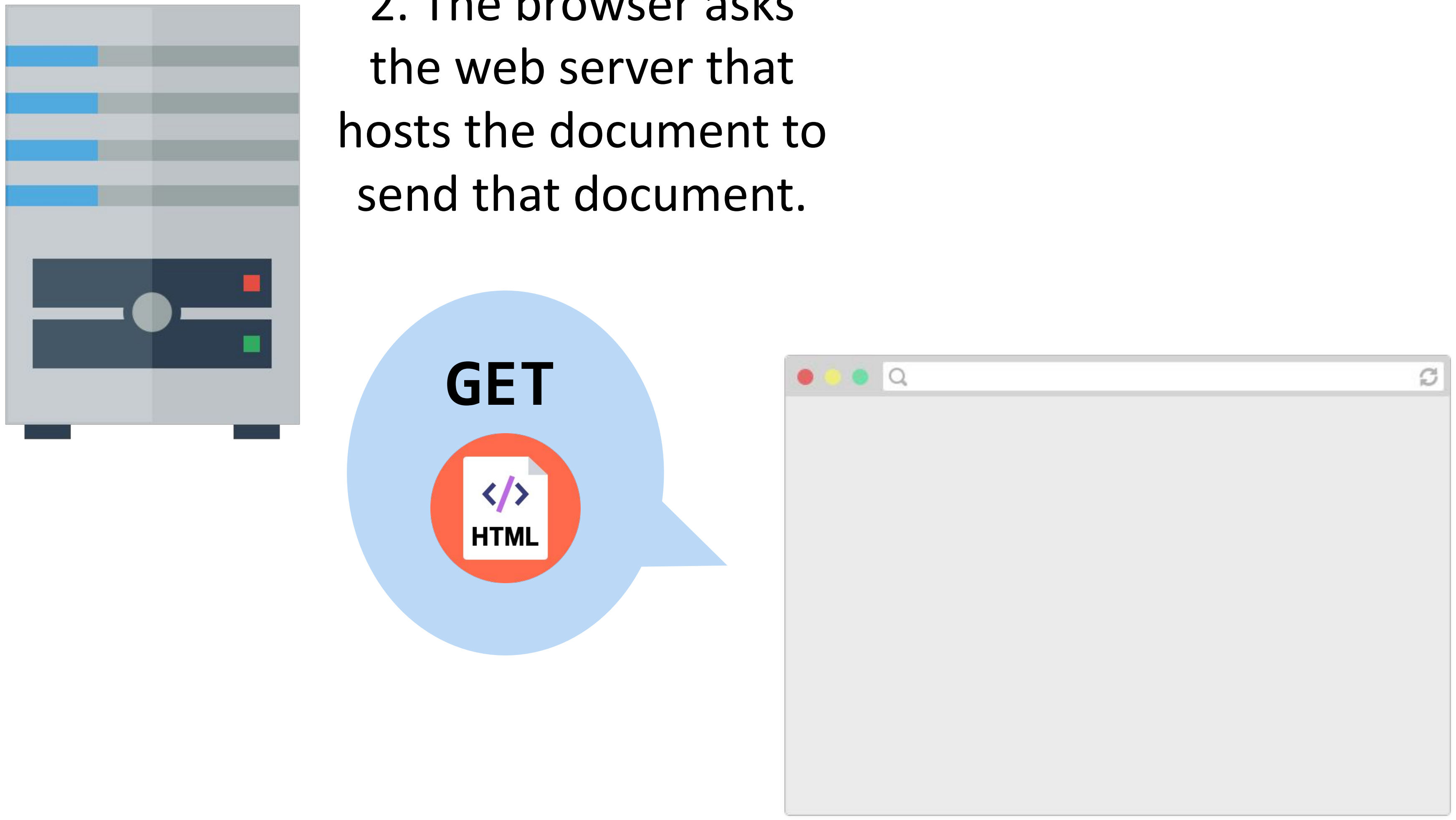
How do web pages work?

1. You type in a URL, which is the address of the HTML file on the internet.



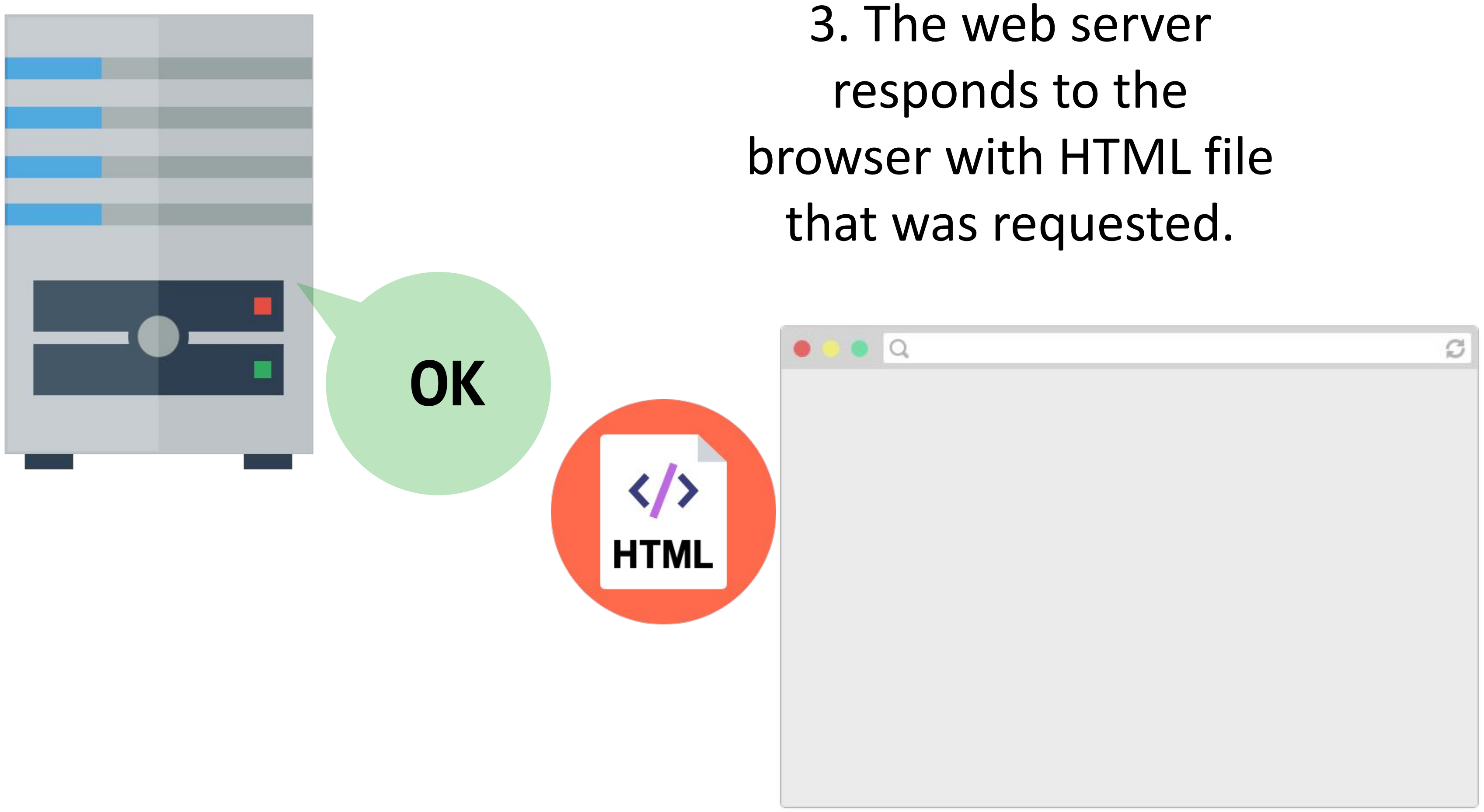
How do web pages work?

2. The browser asks the web server that hosts the document to send that document.



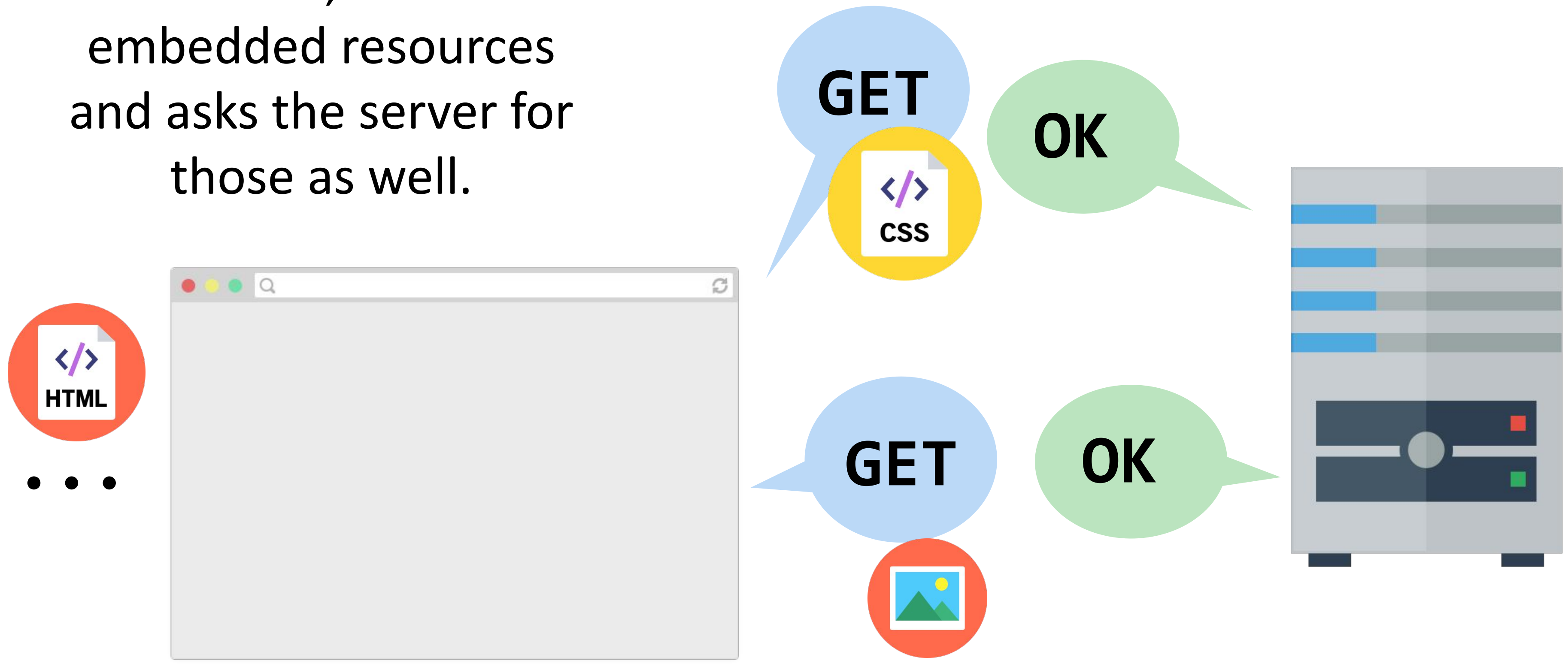
How do web pages work?

3. The web server responds to the browser with HTML file that was requested.



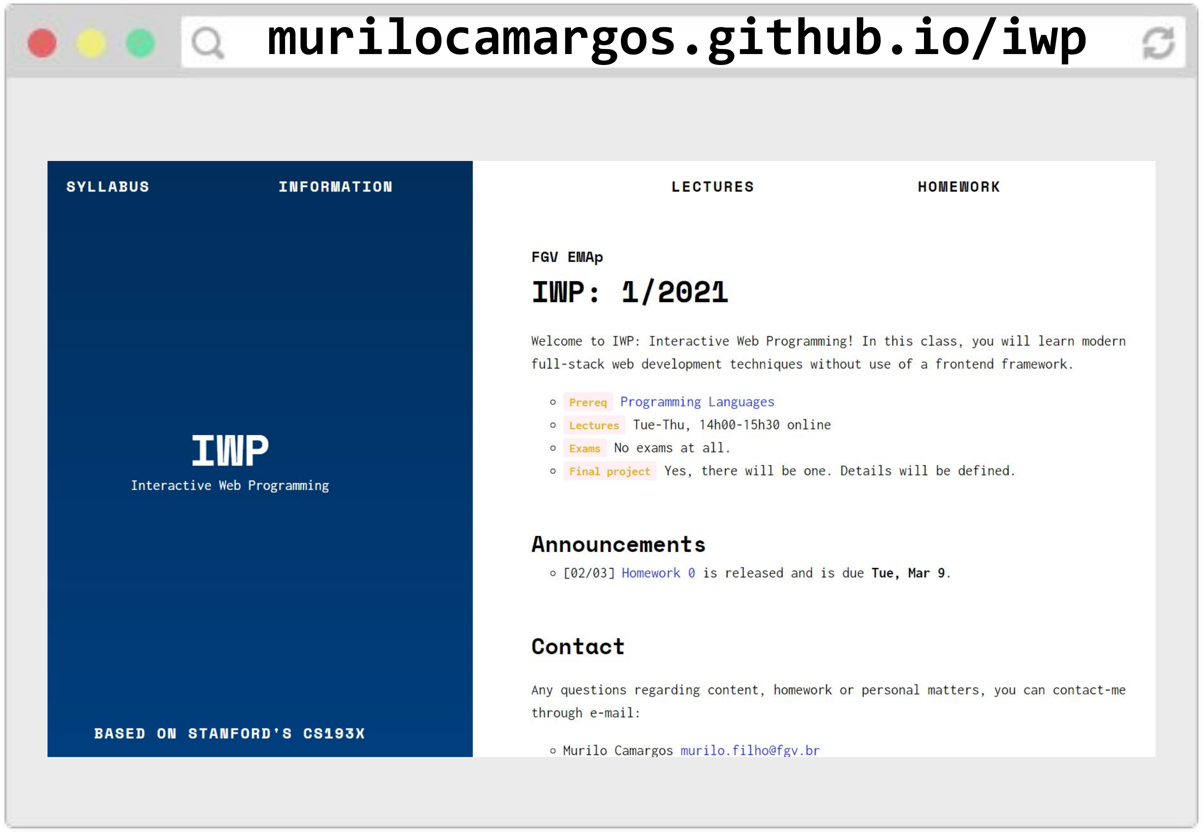
How do web pages work?

4. The browser reads the HTML, sees the embedded resources and asks the server for those as well.



How do web pages work?

5. The web page is loaded when all the resources are fetched and displayed.



murilocamargos.github.io/iwp

SYLLABUS INFORMATION LECTURES HOMEWORK

IWP

Interactive Web Programming

BASED ON STANFORD'S CS193X

FGV EMAp

IWP: 1/2021

Welcome to IWP: Interactive Web Programming! In this class, you will learn modern full-stack web development techniques without use of a frontend framework.

- Prereq Programming Languages
- Lectures Tue-Thu, 14h00-15h30 online
- Exams No exams at all.
- Final project Yes, there will be one. Details will be defined.

Announcements

- [02/03] Homework 0 is released and is due **Tue, Mar 9**.

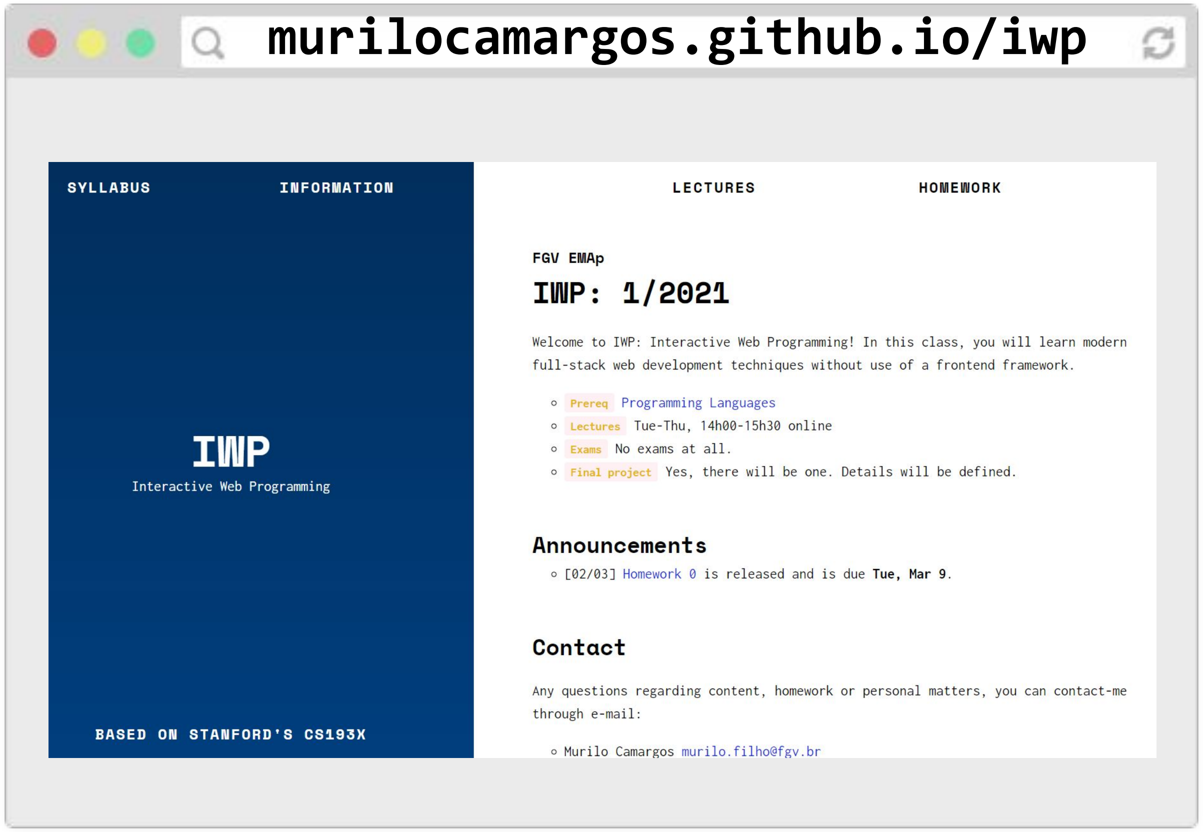
Contact

Any questions regarding content, homework or personal matters, you can contact-me through e-mail:

- Murilo Camargos murilo.filho@fgv.br

P.S.

(That was obviously very hand-wavy. We'll get more detailed when we talk about servers later in the quarter.)



murilocamargos.github.io/iwp

SYLLABUS INFORMATION LECTURES HOMEWORK

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HTML and CSS

What is HTML?

HTML (**H**ypertext **M**arkup **L**anguage)

- Describes the **content** and **structure** of a web page; not a programming language.
- Made up of building blocks called **elements**.

```
<p>
  HTML is <em>awesome!!!</em>
  <img src="puppy.png" />
</p>
```

Basic HTML page structure
(i.e. copy/paste boilerplate)

```
<!DOCTYPE html>
<html>
  <head>
   <title>CS 193X</title>
  </head>

  <body>
   ... contents of the page...
  </body>
</html>
```

Saved in a *filename*.**html** file.

Basic HTML page structure

(i.e. copy/paste boilerplate)

```
<!DOCTYPE html>
<html>
  <head>
   <title>CS 193X</title>
  </head>

  <body>
   ... contents of the page...
  </body>
</html>
```

Metadata that doesn't appear in the viewport of the browser

E.g. **`<title>`** shows up as the name of the tab

Contents that render in the viewport of the browser

HTML elements

```
<p>
  HTML is <em>awesome!!!</em>
  <img src="puppy.png" />
</p>
```

- An element usually has start and ending tags (`<p>` and `</p>`)
  - **content**: stuff in between start and end tags
- An element can be self-closing (`img`)
- An element can have attributes (`src="puppy.jpg"`)
- Elements can contain other elements (`p` contains `em` and `img`)

Some HTML elements

(to place within **`<body>`**)

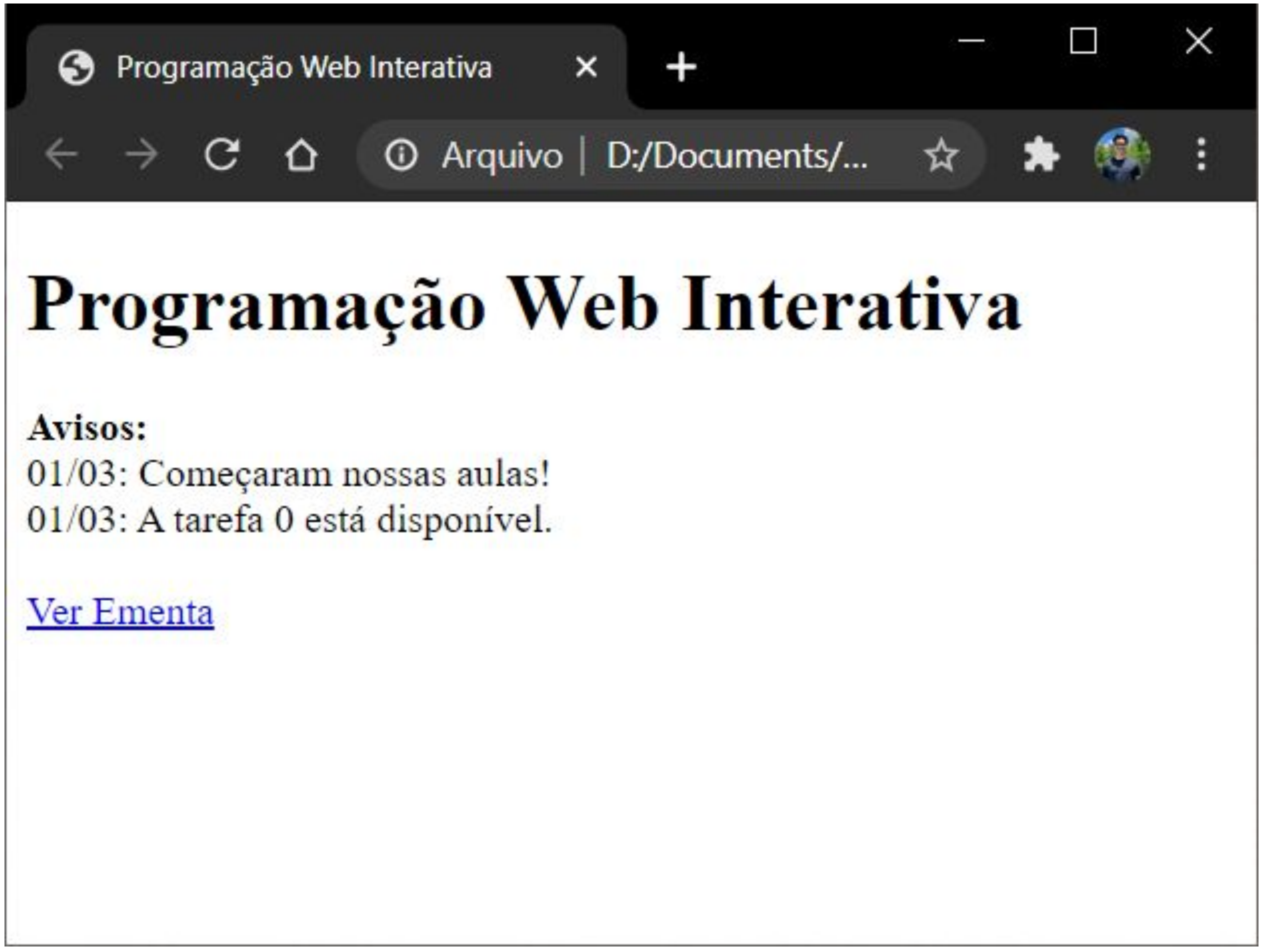
Top-level heading **`h1, h2, … h6`**	**`<h1>`**`Moby Dick`**`</h1>`**
Paragraph	**`<p>`**`Call me Ishmael.`**`</p>`**

Line break	`since feeling is first`**`<br/>`**
	`who pays any attention`

Image	**`<img src="cover.png" />`**
Link	**`<a href="google.com">`**`click here!`**`</a>`**
Strong (bold)	**`<strong>`**`Be BOLD`**`</strong>`**
Emphasis (italic)	`He's my `**`<em>`**`brother`**`</em>`**` and all`

Exercise: Course web page

Let's write some HTML to make the following page:



Programação Web Interativa

Avisos:
01/03: Começaram nossas aulas!
01/03: A tarefa 0 está disponível.

Ver Ementa

Exercise: Course web page

HTML boilerplate

```
<!DOCTYPE html>
<html>
  <head>
    <title>Programação Web
Interativa</title>
  </head>

  <body>
    ...
  </body>
</html>
```

Plaintext contents of the page

```
Programação Web Interativa

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aulas!
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disponível.

Ver Ementa
```

CodePen

Solution

```html
<!DOCTYPE html>
<html>
  <head>
    <title>Programação Web Interativa</title>
  </head>
  <body>
    <h1>Programação Web Interativa</h1>
    <strong>Datas importantes:</strong><br/>
    01/03: Começaram nossas aulas!<br/>
    01/03: A tarefa 0 está disponível.<br/>
    <br/>
    <a href="https://murilocamargos.github.io/iwp/syllabus">
      Ver Ementa
    </a>
  </body>
</html>
```

That was weird

- We saw that HTML whitespace collapses into one space…

```
<h1>Programação Web Interativa</h1>
<strong>Avisos</strong><br/>
01/03: Começaram nossas aulas!<br/>
```

- Except weirdly the `<h1>` heading was on a line of its own, and `<strong>` was not.

CSS

CSS

CSS: **C**ascading **S**tyle Sheets

- Describes the **appearance** and **layout** of a web page
- Composed of CSS **rules**, which define sets of styles

```
selector {
  property: value;
}
```

CSS

A CSS file is composed of **style rules**:

```
selector {
  property: value;
}
```

selector: Specifies the HTML element(s) to style.
property: The name of the CSS style.
value: The value for the CSS style.

Saved in a *filename*`.css` file.

CSS

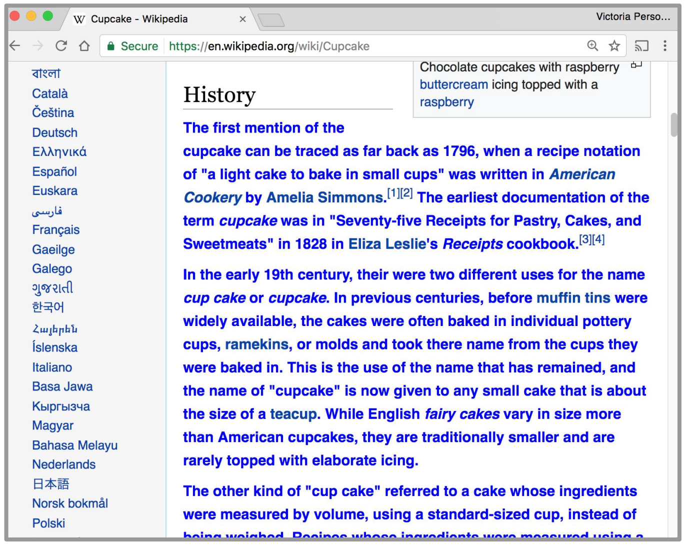
```
// NOT REAL CSS
fork {
  color: gold;
}
```

"All forks on the table should be gold"

CSS

```
p {
  color: blue;
  font-weight: bold;
}
```

"All <p> elements on the page should be blue and bold"



Cupcake - Wikipedia

Victoria Perso...

Secure https://en.wikipedia.org/wiki/Cupcake

বাংলা
Català
Čeština
Deutsch
Ελληνικά
Español
Euskara
فارسی
Français
Gaeilge
Galego
ગુજરાતી
한국어
Հայերեն
Íslenska
Italiano
Basa Jawa
Кыргызча
Magyar
Bahasa Melayu
Nederlands
日本語
Norsk bokmål
Polski

Chocolate cupcakes with raspberry buttercream icing topped with a raspberry

History

The first mention of the cupcake can be traced as far back as 1796, when a recipe notation of "a light cake to bake in small cups" was written in *American Cookery* by Amelia Simmons.[1][2] The earliest documentation of the term *cupcake* was in "Seventy-five Receipts for Pastry, Cakes, and Sweetmeats" in 1828 in Eliza Leslie's *Receipts* cookbook.[3][4]

In the early 19th century, their were two different uses for the name *cup cake* or *cupcake*. In previous centuries, before muffin tins were widely available, the cakes were often baked in individual pottery cups, ramekins, or molds and took there name from the cups they were baked in. This is the use of the name that has remained, and the name of "cupcake" is now given to any small cake that is about the size of a teacup. While English *fairy cakes* vary in size more than American cupcakes, they are traditionally smaller and are rarely topped with elaborate icing.

The other kind of "cup cake" referred to a cake whose ingredients were measured by volume, using a standard-sized cup, instead of being weighed. Recipes whose ingredients were measured using a

Linking CSS in HTML

(i.e. copy/paste boilerplate)

```
<!DOCTYPE html>
<html>
  <head>
    <title>IWP</title>
    <link rel="stylesheet" href="filename.css" />
  </head>

  <body>
   ... contents of the page...
  </body>
</html>
```

Some CSS properties

There are over 500 CSS properties! Here are a few:

Font face (mdn)	`font-family: Helvetica;`
Font color (mdn)	`color: gray;`
Background color (mdn)	`background-color: red;`
Border (mdn)	`border: 3px solid green;`
Text alignment (mdn)	`text-align: center;`

Aside: Mozilla Developer Network (MDN) is the best reference for HTML elements and CSS properties

- The actual W3 spec is very hard to read (meant for browser developers, not web developers)

Main ways to define CSS colors:

140 predefined names (list)

```
color: black;
```

rgb() and rgba()

```
color: rgb(34, 12, 64);
color: rgba(0, 0, 0, 0.5);
```

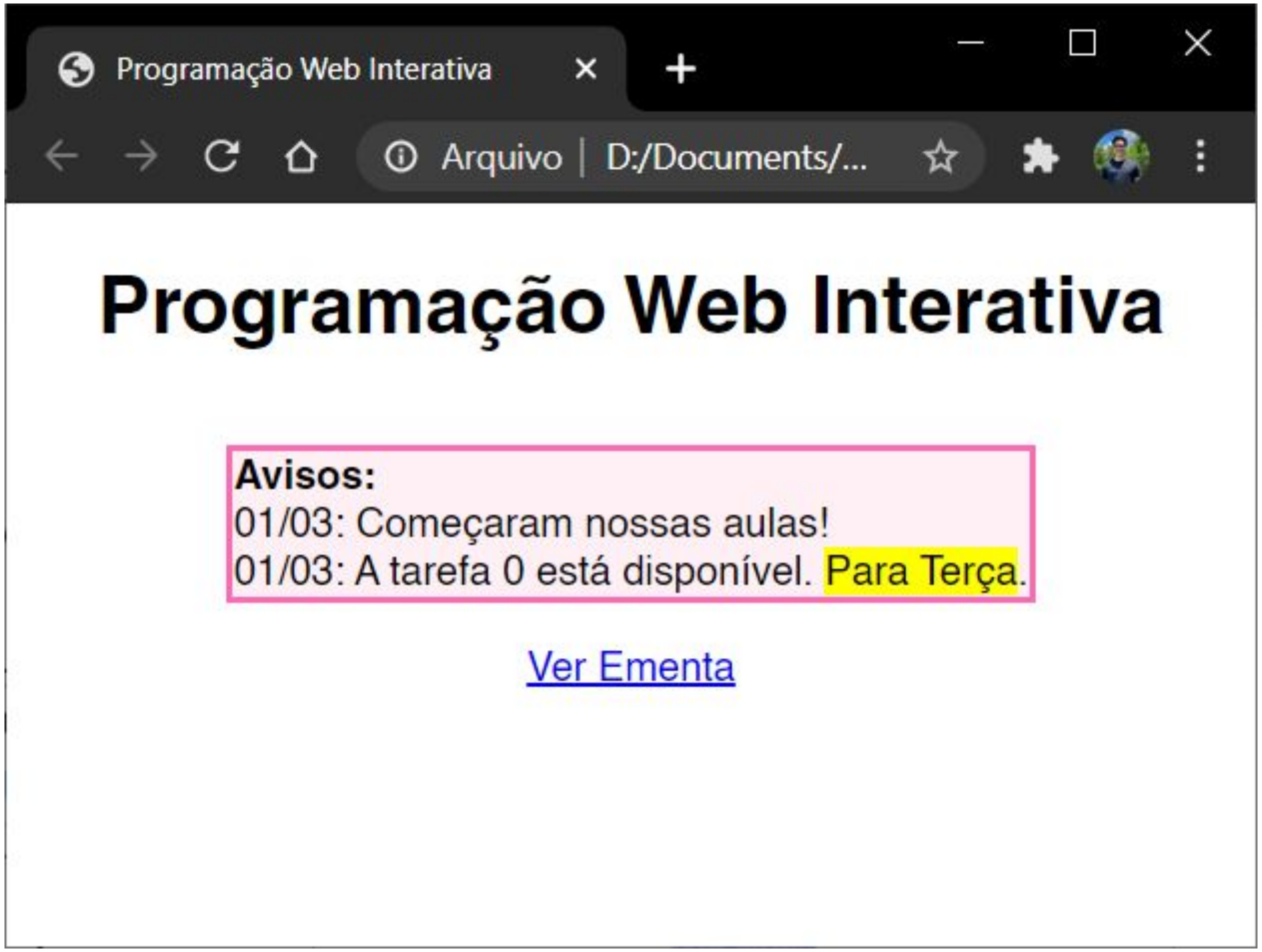
Hex values

```
color: #00ff00;
color: #0f0;
color: #00ff0080;
```

- The "a" stands for **alpha channel** and is a **transparency** value
- Generally prefer more descriptive over less:
    1. Predefined name
    2. rgb / rgba
    3. Hex

Exercise: Course web page

Let's write some CSS to style our page:



Programação Web Interativa

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Ver Ementa

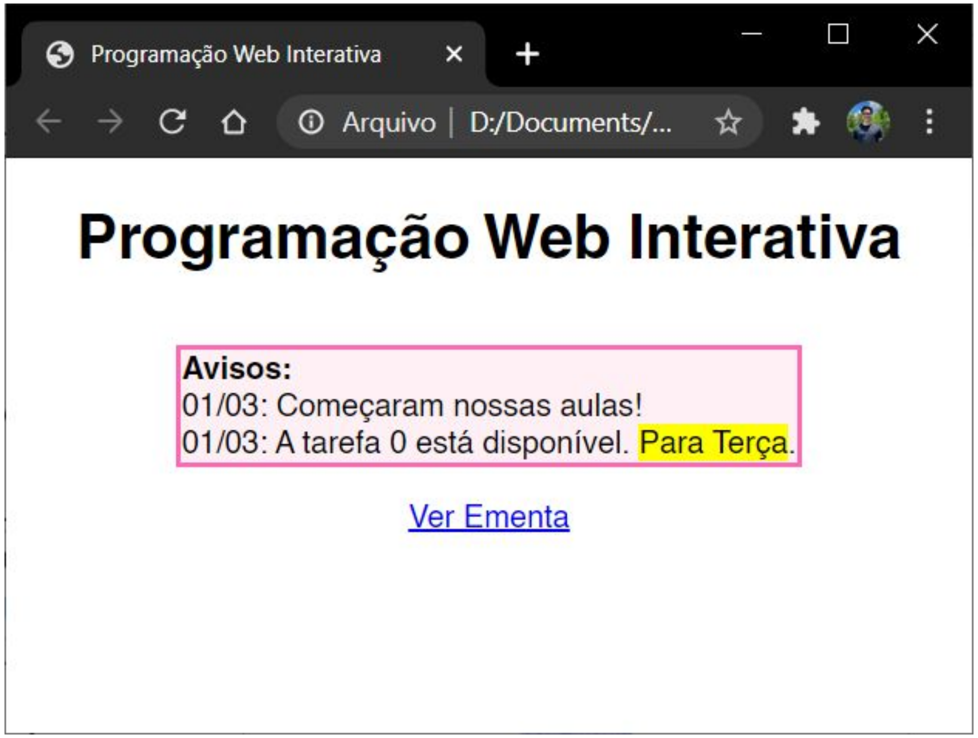
Exercise: Course web page

Let's write some CSS to style our page:

Font face: Helvetica

Border: `hotpink 3px`
Background color: `lavenderblush`
Highlight: `yellow`

- Box is **centered**
- Header and link are **centered**
- Box contents are **left-aligned**



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CodePen

CSS exercise debrief

Some **key techniques:**

- Add invisible containers in HTML to select groups of elements in CSS.
- Apply styles to parent / ancestor element to style parent and all its children. (Will talk more about this later.)

But we encountered **more weirdness**...

- Couldn't set `text-align: center;` to the `<a>` or `<strong>` tags directly, but could center `<p>` and `<h1>`
- Had to set a `width` on the box to make it hug the text … any other way to do this?
- How to center the box?! How do you highlight?!

Q: Why is HTML/CSS so bizarre??

A: There is one crucial set of rules we haven't learned yet...

block vs **inline** display

Next time!

Homework 0 is
out now, due Tuesday
March 9